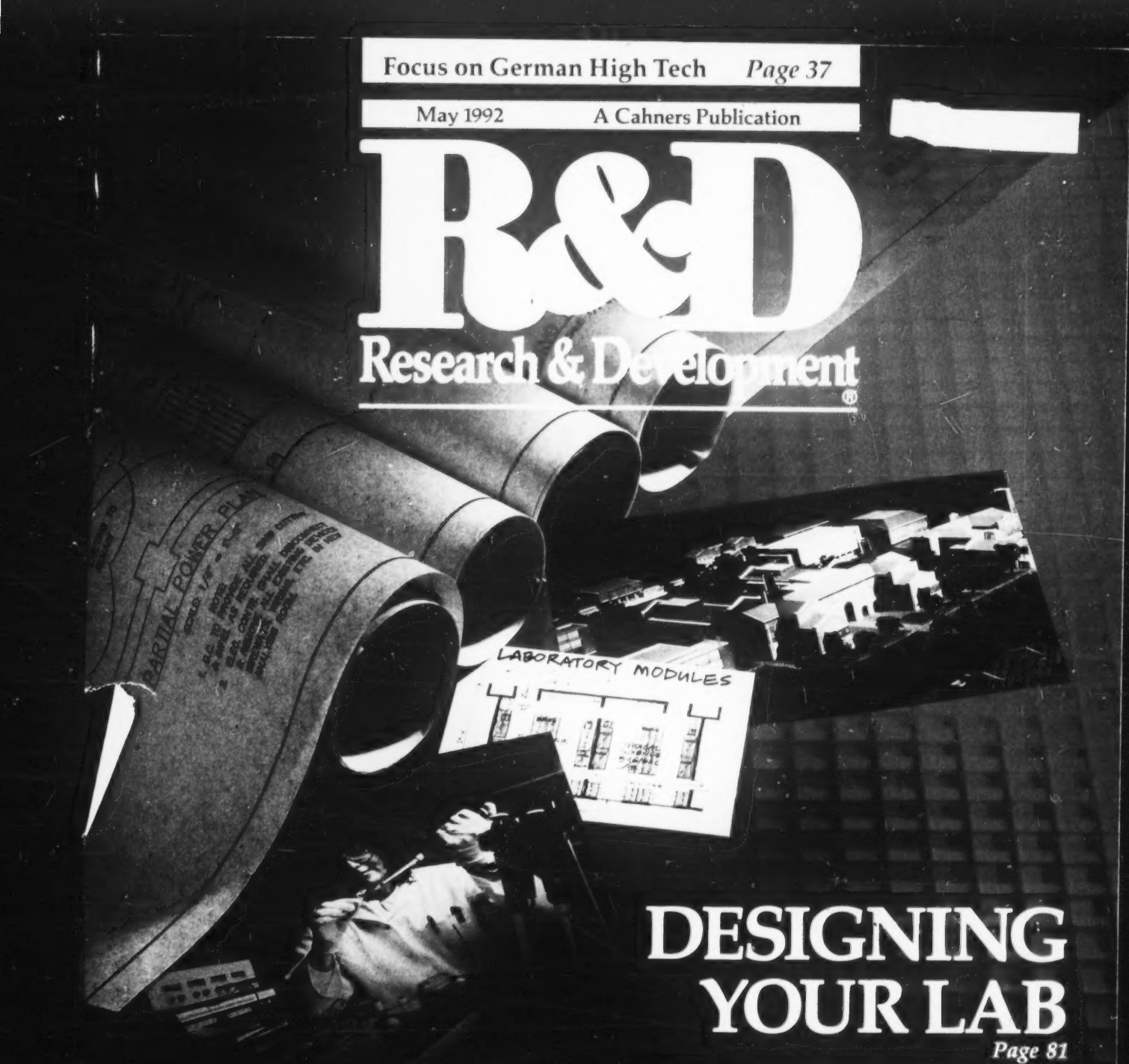
Focus on German High Tech *Page 37*

May 1992 A Cahners Publication

R&D

Research & Development®



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ABOUT THE COVER *R&D Magazine* presents a special feature section devoted to designing and locating your new research facility. See articles beginning on page 65.

R&D

The International Magazine of Research and Development

FEATURES

INTERNATIONAL R&D

Spotlight on German Technology 37

A reunified Germany demonstrates the strength of its technology in aerospace, automotive design, environmental research, lasers, optics, instrumentation, medical devices, vacuum technology, and semiconductors. Plus an interview with the Minister of Research & Technology.

R&D MANAGEMENT

Locating Your Research Facility 65

An exclusive R&D management report details the results of a survey conducted by *R&D Magazine* in which 1,000 top-level R&D executives were asked to specify the issues that you must address if a new research facility is to succeed. The survey identified 25 top considerations.

R&D AWARDS

Rice University's Star Rises to Top Spot 72

Rice's George R. Brown Hall is named *R&D's* Laboratory of the Year. Three other labs receive special recognition.

Lab of the Year, page 72

LABORATORY DESIGN

Planning a New Laboratory? Here's How To Do It 81

The design and construction of a research facility involves balancing three conflicting objectives: quality, cost, and scheduling.

LAB DESIGN PRODUCTS

Editor's Choice 85

Here's a selection of new products to consider when designing or updating your lab.

LASER RESEARCH

Diode Pumped Lasers Finding Commercial Applications 89

Diode pumped solid-state lasers are starting to prove themselves in materials processing and other commercial areas.

VACUUM TECHNOLOGY

Is 1992 the Year of the Mini In Cleanroom Technology? 97

Only a few years ago, robotically controlled mini-environments were a radical idea. Now, the only question is when the idea will sell.

R&D BUSINESS

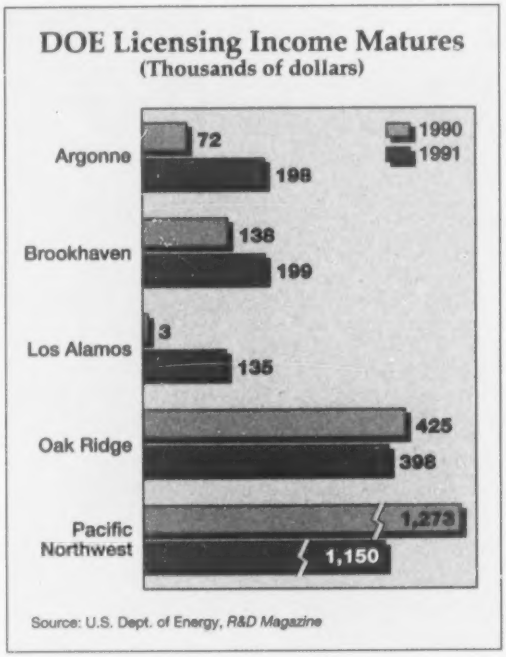
Upward Trend Shown in National Labs' Ability to Transfer Technology

The number of new licenses and the licensing income from technology developed at U.S. Dept. of Energy national laboratories and transferred to the industrial sector are slowly increasing, according to a recent survey by *R&D Magazine*.

For five of the nine multiprogram DOE laboratories for which information was available, the number of new licenses granted increased from 76 in 1990 to 82 in 1991. Licensing income increased nearly 9% from $1.9 million in 1990 to $2.1 million in 1991.

Royalties generally lag behind licensing activity because development and introduction into the marketplace usually take several years.

A significant amount of the current royalties went directly back to the laboratory inventors. Dependent upon the specific laboratory and the size of the royalty, inventors received from 15% to 50% of the royalties. In general, the remaining royalties were retained by the laboratory for general R&D or to support technology transfer activities, such as patent prosecution, employee awards programs, or to support cooperative research and development agreement (CRADA) programs.



Licensing income from tech transfer programs at U.S. DOE national labs often is evenly split between the product inventors and support for further programs.

Patenting, including foreign coverage, also has increased over the past several years. Pacific Northwest Labs, Richland, WA, for example, has increased its annual U.S. patent average from 10 to 25 applications per year.

"The DOE encourages transferring these achievements to universities and to industry," says William Harper, director of the Office of Energy Research, Washington, DC.

The 176-page *Technology '91* summarizes the technologies available for transfer from DOE labs. For a copy, call 615/576-8401. —*Tim Studt*

Social Concerns Spur Materials Choices

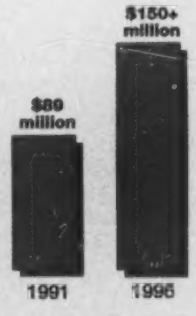
Social concerns have much more importance in the selection and development of new materials than they had in the past, according to a recent U.S. Bureau of Mines report on advanced materials, *The New Materials Society, Volume 3—Materials Shifts in the New Society*.

Issues such as how much energy is needed to produce a new material, how the material or its production process affects the environment, if the material is renewable, or if it is recyclable are being given the same weight as conventional selection criteria, such as cost, availability, performance, and customer preference.

As a result, the people involved in selecting and approving new materials have changed, according to the report. Design engineers used to be left alone to make most materials selections, but now middle and upper management are routinely involved in the materials selection process to ensure compliance with all environmental and nontechnical issues.

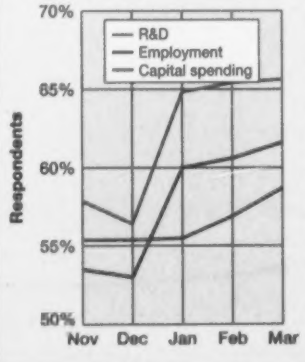
For a copy of the report ($7) or volumes one ($8.50) or two ($15), call 202/512-2457. □

Computers Drive LIMS Growth



Technological advances, resulting in the increased flexibility and cost effectiveness of computer systems, are driving 11% annual growth in laboratory information management systems (LIMS), according to Strategic Directions Intl., a Los Angeles-based consulting firm.

Once dominated by mini- and mainframe computers, PC-based systems now account for about 35% of LIMS sales.



R&D Outlook Up

Corporate executives' confidence in their ability to maintain or increase their R&D efforts over the next several months reached its highest level in March from readings taken over the past 10 months by Newton, MA-based Cahners Economics.

This was the third straight increase, following the late-1991 confidence slump.

R&D

LOCATING YOUR RESEARCH FACILITY

AN R&D EXCLUSIVE MANAGEMENT REPORT

ettling on a decision to build a new R&D facility is an involved process for any organization. The timing of such a move is crucial, as are an array of factors that impact on site location. *R&D Magazine* recently asked 1,000 top-level R&D executives to specify the issues that you must address if a new facility is to succeed. The U.S. and Canadian research executives—all readers of *R&D Magazine*—identified 25 top considerations and ranked them in their order of importance. These industry executives speak from experience. Three out of four have been involved with new laboratory construction, and nearly 40% plan to build a new facility or expand their existing laboratory within the next two years. The survey, believed to be the first of its kind, revealed:

The most important factor in deciding *whether* to build an R&D facility is the demand for research projects within the company.

The corporate bottom line and the financial climate generally dictate the *timing* of the move.

A host of labor issues affect site location—including the availability of a technical labor force, the local education level, housing costs, and even the local work ethic.

Easy access to the European Community and other foreign markets weigh heavily in the decision to locate internationally.

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'Research parks offer staff members more opportunities to exchange thoughts with colleagues in a variety of disciplines, both at work and during leisure hours.'

The demand for research projects within a company is important in focusing attention on the need for some kind of expansion effort, the responding executives indicated. However, the types of projects being proposed determine whether a present laboratory will be expanded or a new facility will be built.

Planning for a new facility must be extensive and based closely on the research activities to be conducted there, with an allowance made for growth, the respondents advised.

"Establish a planning team from the occupants who will staff the new facility. It's very important to have their input," suggests Richard Montgomery, of Unilever Research U.S., Edgewater, NJ.

"Next, determine what departments are best to have contiguous to one another. For example, should the analytical group adjoin the polymer chemistry people or the organic synthesis unit? And after you have placed the groups close to one another, you have to ask how will they expand or contract in the future, once they have been positioned. Remember, as business changes, the physical layout of the research facility may also require modification," says Montgomery.

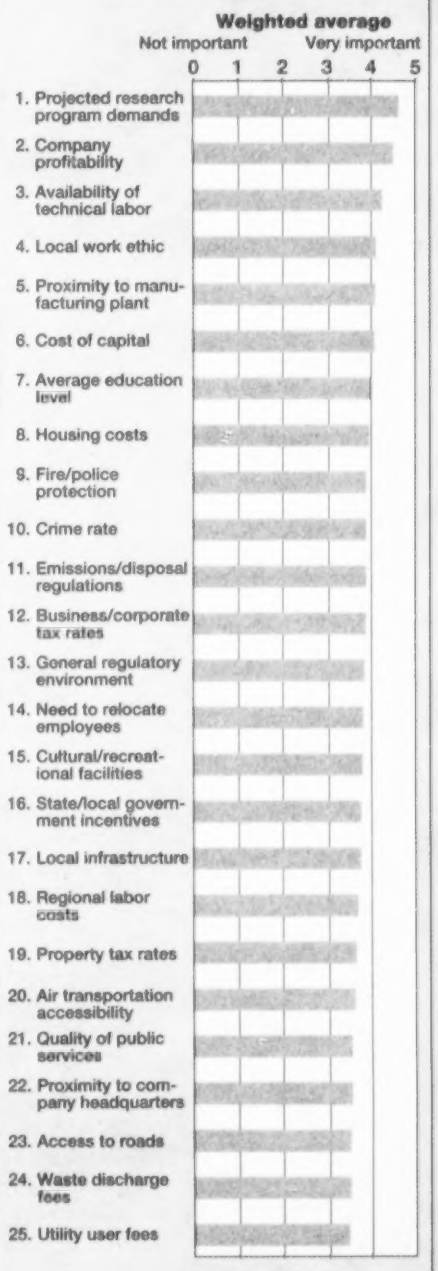
Things really don't get much easier when a facility expansion is involved. "When planning a lab expansion, you have to maintain a delicate balance," says Steven Ostertag, advanced engineering supervisor for Zexel-Gleason USA Inc., Rochester, NY, specialists in automotive drive-train designs. "On one hand, real estate is too expensive to sit idle, but conversely you need to be flexible and have floor space available for any directional changes that may occur in your research program."

Perhaps the "balance" Ostertag mentions should favor idle space somewhat because many respondents warned against making the facility too small.

"Do not underestimate the physical area needed for large equipment and test setups," cautions James Moschenross, test engineering manager at General Connectors Corp., San Fernando, CA. "Items such as environmental chambers, air compressors, and a network of air ducts require tremendous space for satisfactory operation."

"It seems that as soon as we finished

What Are the Important Factors in Choosing a New Laboratory Site?



The top 25 factors to consider when locating a research facility are ranked in order of importance by the R&D executives responding to the site selection survey.

construction, we found that the new facility just wasn't big enough," bemoans another veteran manager who received his stripes in a lab expansion project.

Several R&D executives indicated their first step in planning a new facility was to hire a consulting architectural and engineering firm, one that has experience in building research laboratories. The key is to find a firm who understands the R&D business, can provide a layout, estimate costs, and then know where to make compromises to fit the budget.

Ideally, the timing of an expansion program should be dictated by market projections for the products to be developed in the new facility.

In the real world, however, financial considerations dominate. And the most dominant of all is the company's profitability picture, the survey showed. Next comes the cost of capital, followed by the availability of financing and the economic outlook at both the national and local levels.

"Keep an eye on the return on investment" was a comment heard from many respondents.

Even with our current uncertain economic climate, nearly 40% of the respondents stated their organization is planning to build a new facility or expand their existing laboratory within the next two years—a very positive indicator of future research activity.

Of the factors affecting the selection of a site for a new R&D facility, the highest ranking were the availability of a technical labor force and the local workers' work ethic. The local educational level was also an important consideration, but scored farther down the list.

Proximity to the company's manufacturing plant ranked fifth in importance. This was stressed particularly by executives at diversified companies like MacLean-Fogg Industries, Mundelein, IL, where a multiple laboratory arrangement is used.

"We have seven manufacturing plants, each producing different products and serving different markets. As a result, we tend to be very decentralized and require a product/process development laboratory to be located at each manufacturing facility," says George Pazdirek, MacLean-Fogg's engineering vice president.

Although 55% of the respondents indicated they had no preference in locating a new facility on a stand-alone site or in a research park, 27% did prefer a stand-alone site adjacent to either the company's manufacturing plant or corporate headquarters.

However, 18% of the R&D executives questioned said they would prefer to be located in a research park because of the unique advantages available in that environment.

"Research parks offer more opportunities for staff members to exchange thoughts with other colleagues in a variety of disciplines, both at work and during leisure hours," says one enthusiastic manager.

The sharing of resources is another benefit found in a research park. The proximity of such synergistic relationships could prove to be a hidden treasure.

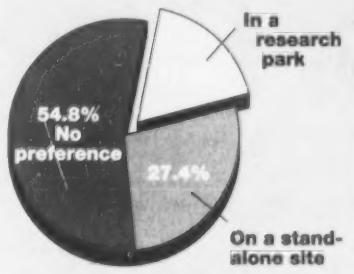
Yet some R&D managers saw dangers in all this. One felt that a separate location provides better protection for trade secrets. Another respondent stated that the stand-alone site concept helps a company focus on its identity.

Rounding out the list of major factors to consider in locating a facility were considerations such as local housing costs, the crime rate, fire and police protection, corporate tax rates, and the regulatory environment.

The need to relocate employees, local cultural and recreational opportunities, and the quality of local infrastructure also appear to be significant factors in selecting a research facility location.

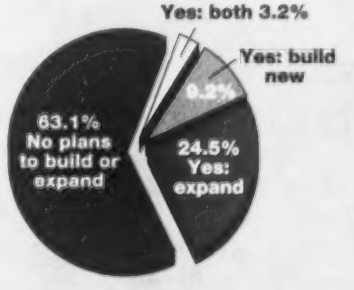
The time may come in your professional career when you will be asked to participate in a laboratory construction project. If you are like our R&D professionals, you will find it to be a worthwhile learning experience.

Where Would You Locate a New Facility?



The environment of a research facility is just as important as its address. Research parks can offer unique advantages.

Plan To Build or Expand Within 2 Years?



Nearly 40% of the respondents are planning new laboratory construction or expansion—a positive indicator of future research activity.

Foreign Research Centers Make Sense

A foreign R&D facility lets you tailor your product to the marketplace in which it will be sold.

Thirty percent of the respondents to our survey noted that their companies currently operate a research facility in a foreign country.

Our survey found that the most important reason for doing so revolves around the opportunity to better serve the European Community and the other international markets.

"You have to make your R&D relevant to the marketplace," says Zexel-Gleason's Ostertag.

"If you want to be in touch with your customers, you need to be where your customers are," continues Ostertag. "And this means either you transport your R&D people around the world continually, or you set up small R&D spin-off centers in each country."

Jonathan Yuen, director of Singapore's Economic Development Board, New York, also stressed the importance of tailoring a company's product to fit the marketplace in anticipation of selling that product in the foreign market.

"This might involve minor design alterations, or it may require developing an entirely new product from scratch, depending upon the industry," says Yuen.

Having a direct link to international technology also scored very high as a reason to locate internationally.

"Synergy is an excellent benefit obtained from locating a research facility in a foreign country," says John Falk, an independent consultant in Northbrook, IL. "You frequently get a different perspective from researchers who were born and educated outside the U.S., offering different points of view to similar problems.

"The marketplace also can provide a different perspective because of the cultural differences," says Falk. "However, making use of this requires not only the desire to do so on the part of technical management, but upper management's commitment as well."

The availability of a country's skilled technical labor force was another major attraction.

"In the R&D business, the three prime considerations are people, people, and people," says Martin Togneri, North American director of Locate In Scotland, Stamford, CT.

"The quality of the people, the skills they demonstrate through their research and development activities, and their track record of innovation all indicate the level of their technical ability," states Togneri. "These are the factors companies should consider very carefully when searching for offshore R&D locations."

U.S. companies are recognizing the need for offshore research centers. "With international sales approaching 50% of total revenue, we may eventually consider establishing an R&D facility in a foreign country," says Leonard Cordone, director of advanced engineering and development at Bausch & Lomb Inc., Rochester, NY.

"Our business projections indicate that major growth opportunities lie outside our domestic markets, and it makes sense for us to be located overseas to support the further development of our product lines, especially in a regulated industry such as ours," says Cordone.

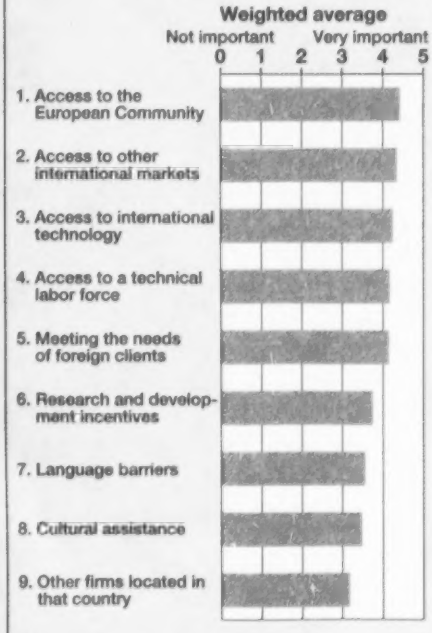
Many countries have established a variety of research and industry-oriented parks to encourage R&D facilities to locate on their soil.

"Foreign corporations have been quick to take advantage of France's high technology environment," says Fanny Hostie, Invest in France Agency, New York. "Many companies have already set up R&D centers within the 35 research parks located throughout our country."

In today's global economy, the future of foreign R&D centers looks extremely bright, especially with so many countries eager to wave their lantern.

—Prepared by Howard J. Goldner, Associate Editor

What's Important in a Foreign Location?


Weighted average
Not important
Very important
0 1 2 3 4 5
1. Access to the European Community
2. Access to other international markets
3. Access to international technology
4. Access to a technical labor force
5. Meeting the needs of foreign clients
6. Research and development incentives
7. Language barriers
8. Cultural assistance
9. Other firms located in that country

Access to foreign markets and technology received high marks by R&D executives. Meeting the needs of foreign clients is also considered important.

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R&D SOFTWARE

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Turn a HPLC Monitor Into A Scanning Fluorometer

The PC-551 UV-Vis software allows the company's RF-551 fluorescence HPLC monitor do double duty as a scanning fluorometer. PC-551 uses the Microsoft Windows graphical interface and provides three acquisition modes (spectrum, quantitative, and time course) to support a wide variety of fluorescence applications. Graphic displays and tool buttons help the researcher find peaks and valleys.
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